



**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re the Application of:

Confirmation No. 4108

Sandro GRECH et al.

Art Unit: 2617

Application No.: 10/766,882

Examiner: Charles Terrell Shedrick

Filed: January 30, 2004

Attorney Dkt. No.: 059643.00316

For: METHOD FOR OPTIMIZING HANDOVER BETWEEN COMMUNICATION NETWORKS

**AFFIDAVIT UNDER 37 CFR § 1.131**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

The undersigned, Sandro Grech, and Leopoldo Alarcón ("the inventors"), hereby declare:

1. We are the inventors of the subject matter of U.S. Patent Application Serial No. 10/766,882 ("present application"), filed on January 30, 2004, and properly claiming the fully perfected priority of UK 0315278.2, filed June 30, 2003.

2. We declare that conception of the subject matter of the present application occurred, and that the presently claims subject matter was conceived, at least earlier than the date of May 30, 2003, as corroborated with evidence, namely:



(1) Exhibit I, which is a first invention report that was prepared before May 30, 2003;

(2) Exhibit II, which is a May 30, 2003, email noting a decision to merge the invention report of Exhibit I with a second invention report, and also incorporating within it two previous emails which illustrate that the two invention reports had been prepared before May 30, 2003; and

(3) Exhibit III, which is a May 9, 2003, email noting the existence at that time of a third invention report.

3. As certified and declared of record, we, the inventors, invented certain new and useful improvements in an invention entitled "METHOD FOR OPTIMIZING HANDOVER BETWEEN COMMUNICATION NETWORKS," which was constructively reduced to practice by the filing of the UK priority application of the present application on June 30, 2003.

4. We declare that reasonable diligence was conducted from before May 30, 2003, to the constructive reduction of practice on June 30, 2003, as corroborated by the following evidence and case law:

(1) Exhibit IV, which is a June 2, 2003, email noting the merger of the third invention report with the invention report of Exhibit I;

(2) Exhibit V, which is a June 3, 2003, email forwarding the merged invention report to a patent attorney;



(3) Exhibit VI, which is a June 5, 2003, email providing a first draft of a patent application to the assignee;

(4) Exhibit VII, which is a June 10, 2003, email providing comments on the draft of the patent application from the inventors to the assignee;

(5) Exhibit VIII, which is a June 10, 2003, email providing the comments of Exhibit VII to the patent attorney;

(6) Exhibit IX, which is a June 13, 2003, email providing additional inventor comments to the patent attorney from the assignee;

(7) Exhibit X, which is a June 18, 2003, email providing comments from the assignee to the patent attorney;

(8) Exhibit XI, which is a June 24, 2003, email providing a final draft of the application for final review by the inventors and assignee; and

(9) The CCPA (predecessor to the Federal Circuit) has held that a lapse of time of approximately two weeks for the inventors to review an application falls within the limits of reasonable delay. *Sletzinger v. Lincoln*. 410 F.2d 808, 161 USPQ 725, 728-729 (1969). The delays here, if any, are each less than two weeks.

5. "Seamless Handoff of Mobile Terminal from WLAN to cdma2000 Network" of Parikh *et al.* ("Parikh") alleged (according to the USPTO) to have been published on May 30, 2003, is therefore antedated as provided herein this Declaration under 37 C.F.R. §1.131, and therefore not prior art as to any aspects of U.S. Patent Application Serial No. 10/766,882 (*i.e.* the present application). Parikh's publication date

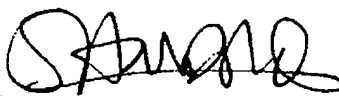


is after the inventors' conception of the subject matter of the present application. Therefore, the evidence provided by this affidavit and corroborated by the enclosed exhibits establishes conception of the subject matter of the present application prior to the citable date of Parikh coupled with due diligence from prior to the citable date of Parikh to the constructive reduction of practice of filing the present application.

6. That all statements made herein are believed to be true and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful, false statements may jeopardize the validity of this patent application, or any patent issuing thereon.

Date: 25. April. 2008

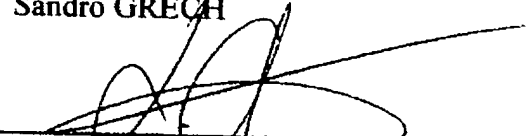
Signed: \_\_\_\_\_



Sandro GRECH

Date: 24. April. 2008

Signed: \_\_\_\_\_



Leopoldo ALARCON



# Exhibit I



## INVENTION REPORT

Title of invention: Optimized handovers from WLAN to UMTS Networks		<b>INVENTION REPORT RECEIVED</b>	
		Code:	Patent Committee:
<b>THE DESCRIPTION OF THE INVENTION MUST BE ATTACHED</b>		Place:	Date:
		Signature:	
Inventor's name, employee number, title and nationality: *) Govind Krishnamurthi [REDACTED] Senior Research Engineer India  Hemant Chaskar [REDACTED] Principal Research Engineer India  Dirk Trossen [REDACTED] Senior Research Engineer Germany	Home Address: *) Govind Krishnamurthi [REDACTED]  Hemant Chaskar [REDACTED]  Dirk Trossen [REDACTED]	Business Unit and cost centre: [REDACTED]	
Line Manager(s): Senthil Sengodan, Raj Bansal			
Project : *) )		Project Manager: r	
Office address: [REDACTED]			
Phone: [REDACTED]		Fax: * [REDACTED]	
The invention becomes public on: as soon as possible			
<i>I am/ We are the sole/ and original inventor(s) of this invention.</i>  <i>The company may, by virtue of applicable legislation, be entitled to full or partial rights to the invention. I/ We acknowledge my/ our obligation to sign as inventor(s) all documents that may be required for protecting the Invention in different countries.</i>  <b>Applicable to inventions made by inventors employed in FI, DK, DE and SE only.</b> <i>Unless the inventor requests the Invention Report to be responded to within four (4) months from the date this Invention Report is received or such other period as the mandatory provisions of the applicable local law may otherwise require, the inventor consents to the right of the employer to use a reasonable period of time for the evaluation of the invention. A reasonable period of time may exceed four (4) months.</i> <input checked="" type="checkbox"/> <i>I/ We request that the Invention Report be responded to within four (4) months.</i>  Date: Signature(s) of Inventor(s):			
*) See the instructions			
<i>I have read and understood the invention described in this Invention Report</i>			
Date: Signature of Manager			



**INSTRUCTIONS FOR COMPLETING THE INVENTION REPORT**

This Invention Report form is used in cases where an invention has been made by an employee of the Company. This Invention Report is confidential. Only the Patent Department may make copies of signed Invention Reports in order to request opinions or reply to the inventor(s).

The inventor completes the Invention Report and the description of the invention. The inventor does not fill in the 'Invention Report received' field. This field is filled in by the Patent Department. The Invention Report must have the names of all the inventors and their home addresses. If there is not enough space for all the names, addresses etc, please write them on a separate attachment. The first mentioned inventor is assumed to be the contact person in matters concerning the Invention Report. In the fields of office address, phone and fax, please fill in the contact person's information. Fill in the project field, if the invention is made in a project. The original Invention Report is signed by all inventors. Each page of the original Invention Report is signed by a Manager. In case it is difficult to obtain Manager's signature your Patent Department will take care of it.

It is suggested that the Invention Report and the description of the invention should be filled in as thoroughly as possible. If drawings or other kind of information cannot be attached to this form, they should be delivered separately.

The signed Invention Report is given directly to the local or business unit's Patent Department. Invention Report should also be sent by E-mail to the Patent Department. The Patent Engineer will inform the inventor of receiving the Invention Report. The Patent Engineer will obtain any expert opinions needed to properly evaluate the invention, will procure the Company's decision and inform the inventor accordingly.

*I have read and understood the invention described in this Invention Report*

Date:

Signature of Manager



*I have read and understood the invention described in this Invention Report*

3

Date:  
Signature of Manager



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**INVENTION REPORT APPENDIX****TITLE OF THE INVENTION:****OPTIMIZED HANDOVERS FROM WLAN TO UMTS NETWORKS****INVENTOR(S): GOVIND KRISHNAMURTHI, HEMANT CHASKAR, DIRK TROSSEN****1. BACKGROUND OF THE INVENTION**

With the proliferation of 3G/2.5G (CDMA2000 and WCDMA)/GPRS technologies, it is clear that these technologies will be ubiquitous in the future. A complementary technology that is receiving a lot of attention is that of IEEE 802.11 based WLAN networks. While, 3G networks are designed to support moderate bandwidth requirements under high mobility conditions, WLAN networks are applicable to high bandwidth low mobility scenarios. Further mobile terminals with multiple access interfaces are in the making. In such environments, end users would want to be able to seamlessly transfer their ongoing Internet sessions between WLAN and 3G networks as they move between the coverage areas of these networks. In this invention we illustrate some novel schemes to hasten the handover process between WCDMA and WLAN networks. The advantage of this scheme is that a security association does not need to exist between the two networks.

**2. THE PROBLEM**

For an IP level handover between a WLAN and UMTS/GPRS network to complete the MN must first get link layer connectivity with the UMTS RAN and then be authenticated and authorized at the link layer. Finally, the MN has to perform the PDP context to establish IP level requirements such as QoS parameters etc. The details of these procedures can be found in [1].

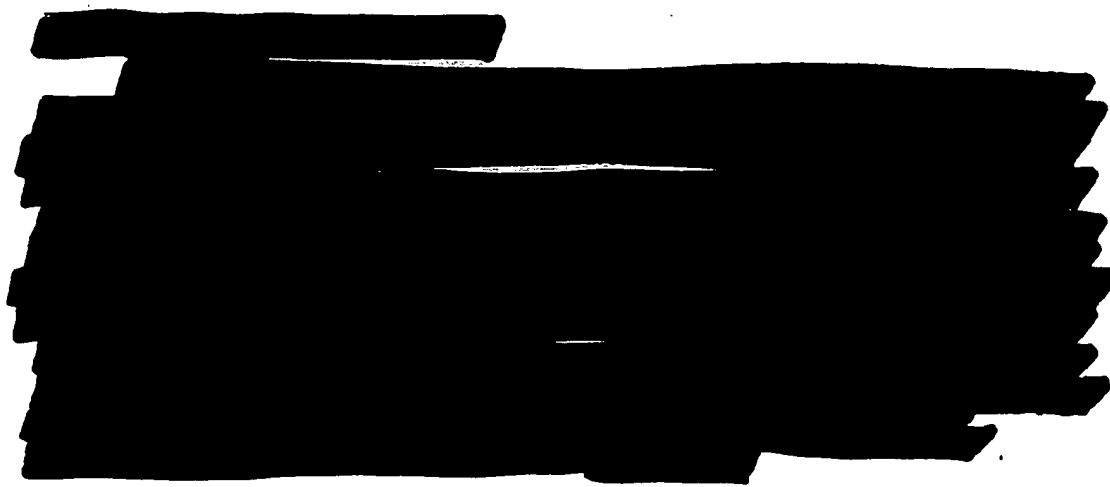
Consider the following case: the MN initiates an IP session while it is roaming in the WLAN network and is moving into 3G coverage. If the MN has to perform all the protocols previously described in this section, the time involved will cause a disruption in the IP session. In several situations depending on the local environment, the region of overlap of the WLAN and UMTS signals may not be very large. Such a situation could occur in various scenarios, such as :

- Moving in and out of tunnels
- Disruption due to certain type of building constructions

In other words, a mobile network must minimize the latency of IP level handovers between WLAN and UMTS so that the chance of non-seamless handovers is minimized.

In this invention, we seek to devise novel schemes to reduce the time for IP level handover by preparing the UMTS network for the MN's arrival both at the link layer and the IP layer prior to the MN's arrival in the UMTS network.





## 5. ADVANTAGES OF THE INVENTION

The invention has the following advantages.

- No security association is expected between the WLAN AR and the GGSN of the 3GPP network
- We perform the L2 authentication procedure at the 3G network while still being attached to the WLAN network, via the WLAN AR. This saves the time in performing the L2 authentication at the 3GPP network, i.e., reducing the latency when actually handing over to UMTS network.
- We perform the PDP context establishment procedure at the GGSN via the WLAN AR. This saves the time involved in establishing PDP context at the 3G network, i.e., further reducing the latency when actually handing over to UMTS network.
- The MN need not have to listen to the actual Node B beacons to engage in the protocol described in this invention.
- This invention is particularly effective when the overlap between the WLAN and UMTS signals is very less and the MN cannot hear the Node B signal yet. In such a case, the AR sends the requisite Node B identifier as well as the GGSN's IP address to the MN.

## 6. DESCRIPTION OF THE INVENTION

In an 3GPP/GPRS network, in order to access the packet switched (PS) service, the MN shall first make its presence known to the network by performing UMTS/GPRS attach. In the attach request, the SGSN needs MN's identity (IMSI) and the indication of which type of attach is to be executed. The SGSN then forwards this information to the MN's HLR to get the MN authenticated. Once the MN is authenticated at the link layer, the MN then proceeds to establish its IP bearers, also known as PDP context, at the GGSN.



This process includes getting temporary IP address(es) and establishing the QoS profile needed for its packet sessions.

In this invention, the information needed to authenticate the MN at the link layer and establish the PDP context is sent to the GGSN of the UMTS network, from the MN, via the WLAN access router while the MN is still connected to the WLAN access router. Note, this can be done even before the MN actually listens to the Node B signal. This may be possible with help from the current AR. To enable this support, the current AR can use protocols like CAR discovery[5]. The MN can send the information required for link level authentication and PDP context activation to the GGSN either as a separate IP packet or piggyback it with other existing signaling for Fast Handovers or Context Transfer. The criteria that indicates to the MN to start this process could be decreasing signal strength or it can be some added information provided by the WLAN network indicating that the MN may be about to leave the WLAN network [6]. The information sent in the packet includes among others, the IMSI of the MN, Node B identifier, QoS profile for PDP context activation and an indication that an IP address will be needed at the UMTS network. The exact information contained in the PDP profile is found in [1]. They include: PDP Type, PDP Address, Access Point Name, QoS Negotiated, TEID, NSAPI, MSISDN, Selection Mode, Charging Characteristics, Trace Reference, Trace Type, Trigger Id, OMC Identity and PDP Configuration Options.

When the GGSN receives this information from the MN, it forwards the IMSI to the appropriate SGSN in its domain through the Iu interface. The correct SGSN in its domain is chosen based on the Node B identifier. The GGSN therefore has to maintain a mapping of SGSN's to Node B identifiers that it consults to choose the correct SGSN. Currently, the GGSN may not maintain such information and maintaining this information would be useful for reducing the time taken by link layer attach procedures. The GGSN also sends Activate PDP context message containing the PDP profile information to the SGSN.

Once the SGSN receives this IMSI and PDP profile information, it begins to authenticate the MN at the L2 layer and establish the PDP context parallelly as follows:

#### PRE-AUTHENTICATION OF A MN

The pre-authentication of a MN is shown in Figure 1.



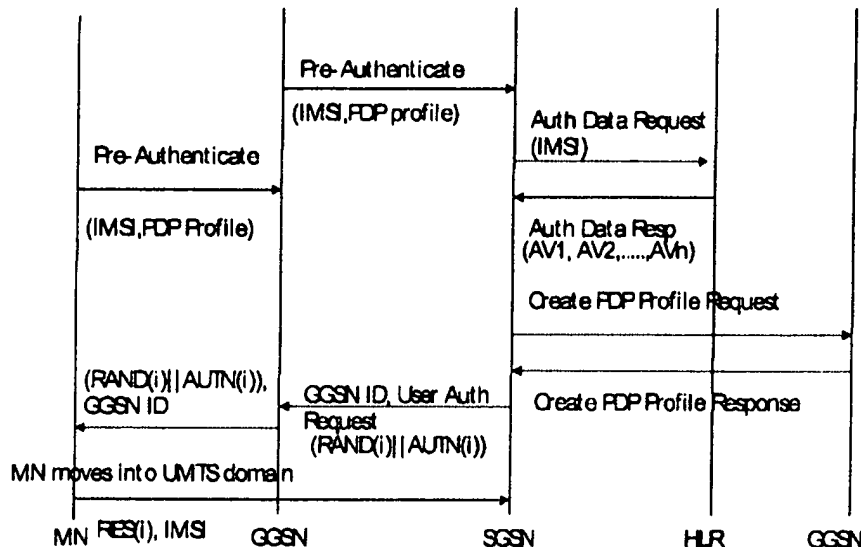


Figure 1: Signalling involved in the Invention

- The SGSN sends an "Authentication data request (IMSI)" to the MN's HLR.
- The HLR answers with an Authentication data response (AV1, AV2, ..., AVn) along with a session key derived from secret key it shares with the MN.
- The SGSN then sends an "User authentication request (RAND(i)||AUTN(i))" to the GGSN. The methodology of calculating the authentication request is prior art. The SGSN also calculates the Expected Response ERES(i) for this request and stores it along with the IMSI of the MN.

#### ESTABLISHMENT OF PDP CONTEXT

In parallel, as described in Figure 1, with establishing the link layer authentication as described previously in this section, the SGSN also establishes the requisite PDP context for the MN based on the information contained in the messages received by the GGSN from the MN. This process also allows the SGSN to choose the GGSN in the 3G network that can satisfy the MN's IP requirements PDP profile. The GGSN that is chosen to host the MN then informs the SGSN that sends in the request about the successful establishment of PDP context. The SGSN then informs the GGSN that is in communication with the MN's WLAN AR is informed about the GGSN that will host the MN. An IP address for the MN is allocated either using stateful means or stateless means (described in the alternatives section) is allocated and this information is also passed on to the GGSN in contact with the MN, to be forwarded to the MN.

#### CONVEYING INFORMATION BACK TO THE MN



When the GGSN receives authentication information GGSN ID and the IP address of the MN, it packages this request and sends it to the MN via the Internet and the AR of the WLAN. This message is encrypted using the session key shared between the MN and its HLR.

#### OPERATIONS AT THE MN ONCE IT RECEIVES THE INFORMATION

- When the MN receives this information, it decrypts the message and authenticates the network, calculates the response RES(i). It also configures its 3G interface for packet sessions with the new IP information.

#### OPERATIONS PERFORMED BY THE MN ONCE IT REACHES THE 3G DOMAIN

- When the MN moves into the UMTS domain or when it chooses to prepare for handover, it sends the RES(i) along with its IMSI information as part of the UMTS Attach to the SGSN, via the associated Node B, which authenticates the MN. The MN can immediately engage in packet sessions using the configured PDP context.

#### NEW INFORMATION NEEDED TO BE STORED IN THE GGSNs OF THE UMTS DOMAIN

When the request from the MN is received by the GGSN, it needs to associate the Node B information to an SGSN in the system. Therefore, each GGSN should store a mapping of Node Bs to SGSNs. This is not very expensive and it is quite easy to implement as the network is centrally controlled by the operator. Also, these associations are generally last for a long time, and sometimes are even permanent for the life of the network, and hence update algorithms may not be needed to check the consistency of this mapping.

### 7. THE ALTERNATIVES

In Section 6, we described a stateful means of providing the MN with an IP address. This involves a DHCP server providing an IP address for the MN. However, IPv6 nodes are capable of autoconfiguring their addresses as described in RFC 2462 [2]. For this purpose, the GGSN shall automatically and periodically send Router Advertisement messages towards the MS after a PDP context of type IPv6 is activated. Since, in our invention the prefix of this GGSN may be different from that of the GGSN known to the MN, the prefix of this GGSN is also packaged in the information sent back to the MN, to help the MN autoconfigure its IP address while still being connected to the WLAN AR.

### 8. USAGE – PUBLICATION



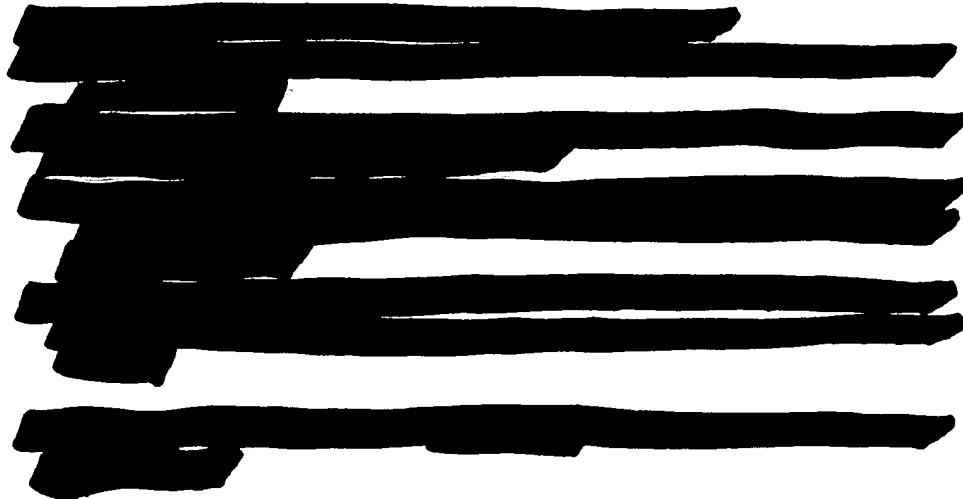
**9. PROJECT AND BUSINESS UNIT**



**10. KEYWORDS**

WLAN, UMTS, Inter-technology handovers

**11. REFERENCES**





# Exhibit II



**Patent-Agency PWF (EXT-RES/London)**

**From:** Rintamäki Tuula (Nokia/Tampere) **Sent:** Fri 30/05/2003 07:11  
**To:** Alarcon Leopoldo (NSN - FR/St-Ouen)  
**Cc:** Grech Sandro (NSN - FI/Espoo); Vesterinen Janne (Nokia/Helsinki)  
**Subject:** RE: Pending patent applications and IPR  
**Attachments:**

Hi,

NC 39886 is merged with NC34945 (reference will be NC34945) [REDACTED]  
[REDACTED]  
[REDACTED]

BR

Tuula

-----Original Message-----

**From:** Vesterinen Janne (NET/Espoo)  
**Sent:** 30 May, 2003 08:41  
**To:** Alarcon Leopoldo (EXT-UMA/Malaga)  
**Cc:** Rintamäki Tuula (NET/Tampere); Grech Sandro (NET/Espoo)  
**Subject:** RE: Pending patent applications and IPR

Hi Leo,

NC39985 is handled by Tuula Rintamäki [REDACTED]  
[REDACTED]

Tuula can you tell us what is the situation of drafting of NC39886. [REDACTED]  
[REDACTED]

About the drafting of NC39894 [REDACTED]  
[REDACTED]

Best Regards,  
Janne

-----Original Message-----

**From:** Alarcon Leopoldo (EXT-UMA/Malaga)  
**Sent:** 29 May, 2003 11:34  
**To:** Vesterinen Janne (NET/Espoo)  
**Cc:** Grech Sandro (NET/Espoo)  
**Subject:** Pending patent applications and IPR

[REDACTED]  
[REDACTED] IPR NC39886 and NC39894 [REDACTED] what patent  
applications would be done for them. Do you know what is the status of this? [REDACTED]  
[REDACTED]

[REDACTED] We have another IPR (NC39965)  
[REDACTED]  
[REDACTED]

BR,  
-Leo



# Exhibit III



**Patent-Agency PWF (EXT-RES/London)**

---

**From:** Rintamäki Tuula (Nokia/Tampere) **Sent:** 05/2003 13:31  
**To:** Alarcon Leopoldo (NSN - FR/St-Ouen); Grech Sandro (NSN - FI/Espoo); Serna Pedro (NET/Malaga)  
**Cc:**  
**Subject:** Invention report NC 39965  
**Attachments:**

Hi,

Thank you for your invention report. I will handle your  
invention Persistent PDP contexts for smoother inter-access handovers towards GPRS (39965).

Best Regards

Tuula Rintamäki

NOKIA  
Patent Engineer  
HVT 30 / D 454 Tampere  
tel. [REDACTED]  
fax [REDACTED]



# Exhibit IV



**Patent-Agency PWF (EXT-RES/London)**

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① This message was sent with High importance



**From:** Lehtisalo Minna (EXT-EilaKaisla/Tampere)

**Sent:** Mon 02/06/2003 10:39

**To:** Patent-Agency PWF (EXT-RES/London)

**Cc:** Rintamäki Tuula (NET/Tampere)

**Subject:** NC39965 merged with NC34945

**Attachments:**  PWF 2.6.2003.doc(77KB)  39965 Invrep.doc(119KB)

Attn: Nicola Shackleton

Dear Ms Shackleton,




NC39965 is merged with NC34945 (you are drafting at the moment) today.

Please find attached Basic invention & Recommendation to PC and invention report of the NC39965.

Best Regards  
Minna Lehtisalo

<<PWF 2.6.2003.doc>> <<39965 Invrep.doc>>

Minna Lehtisalo  
IPR Administrator  
HVT 30 / B 450

~~~~~  
NOKIA  
P.O.Box 785  
33101 Tampere  
Phone:   
Fax:   
e-mail: 

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<<PWF 2.6.2003.doc>> <<39965 Invrep.doc>>



**CONFIDENTIAL**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                |                                                                        |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------|-------|
| Title of invention:<br><b>PERSISTENT PDP CONTEXTS FOR SMOOTHER<br/>         INTER-ACCESS HANDOVERS TOWARDS GPRS</b>                                                                                                                                                                                                                                                                                                                                                                                                                  |                                | <b>INVENTION REPORT RECEIVED</b><br>Code: 39965      Patent Committee: |       |
| <b>THE DESCRIPTION OF THE INVENTION<br/>         MUST BE ATTACHED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                | Place:                                                                 | Date: |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                | Signature:                                                             |       |
| Inventor's name, employee number, title and<br>nationality: *)<br><b>Leopoldo Alarcón</b><br>Research Engineer<br>Spanish                                                                                                                                                                                                                                                                                                                                                                                                            | Home Address: *)<br>[Redacted] | Business Unit and cost<br>centre:<br>[Redacted]                        |       |
| <b>Sandro Grech</b><br>Research Engineer<br>Maltese                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [Redacted]                     | [Redacted]                                                             |       |
| <b>Pedro Serna</b><br>Research Manager<br>Spanish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [Redacted]                     | [Redacted]                                                             |       |
| Line Manager(s): Pedro Serna, Jari Lehmusvuori, Lauri Oksanen,                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                |                                                                        |       |
| Project : *) 3GPP-WLAN Mobility (IPv6 & Mobility<br>SP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                | Project Manager: Sandro Grech                                          |       |
| Office address: *) [Redacted]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                |                                                                        |       |
| Phone: [Redacted]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                | Fax: [Redacted]                                                        |       |
| The invention becomes public on:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                |                                                                        |       |
| I am/ We are the sole/ and original inventor(s) of this invention.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |                                                                        |       |
| The company may, by virtue of applicable legislation, be entitled to full or partial rights to the invention.<br>I/ We acknowledge my/ our obligation to sign as inventor(s) all documents that may be required for protecting the<br>invention in different countries.                                                                                                                                                                                                                                                              |                                |                                                                        |       |
| <b>Applicable to inventions made by inventors employed in FI, DK, DE and SE only.</b><br>Unless the inventor requests the Invention Report to be responded to within four (4) months from the date this<br>Invention Report is received or such other period as the mandatory provisions of the applicable local law may<br>otherwise require, the inventor consents to the right of the employer to use a reasonable period of time for the<br>evaluation of the invention. A reasonable period of time may exceed four (4) months. |                                |                                                                        |       |
| <input type="checkbox"/> I/ We request that the Invention Report be responded to within four (4) months.                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |                                                                        |       |
| Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                                                        |       |
| Signature(s) of Inventor(s):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                |                                                                        |       |

*I have read and understood the invention described in this Invention Report*

•



**INSTRUCTIONS FOR COMPLETING THE INVENTION REPORT**

This Invention Report form is used in cases where an invention has been made by an employee of the Company. This Invention Report is confidential. Only the Patent Department may make copies of signed Invention Reports in order to request opinions or reply to the inventor(s).

The inventor completes the Invention Report and the description of the invention. The inventor does not fill in the 'Invention Report received' field. This field is filled in by the Patent Department. The Invention Report must have the names of all the inventors and their home addresses. If there is not enough space for all the names, addresses etc, please write them on a separate attachment. The first mentioned inventor is assumed to be the contact person in matters concerning the Invention Report. In the fields of office address, phone and fax, please fill in the contact person's information. Fill in the project field, if the invention is made in a project. The original Invention Report is signed by all inventors. Each page of the original Invention Report is signed by a Manager. In case it is difficult to obtain Manager's signature your Patent Department will take care of it.

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The signed Invention Report is given directly to the local or business unit's Patent Department. Invention Report should also be sent by E-mail to the Patent Department. The Patent Engineer will inform the inventor of receiving the Invention Report. The Patent Engineer will obtain any expert opinions needed to properly evaluate the invention, will procure the Company's decision and inform the inventor accordingly.

*I have read and understood the invention described in this Invention Report*

2

Date:  
Signature of Manager



**DESCRIPTION OF THE INVENTION**

Please, describe your invention in the following order. You can enclose the drawings on a separate document.

**1. Field and background of the invention**

This invention relates to IP session continuity across inter-access networks such as WLAN and GPRS.

**2. A summary of the invention**

This invention proposes a method by means of which the PDP Contexts can be maintained activated whilst the mobile node (MN) moves from GPRS to any other access network and after that decides to come back again to the GPRS network.

**3. Describe the problem which the invention overcomes**

When a MN moves from GPRS to any other access network, e.g. WLAN, the MN is detached and the PDP Contexts associated to that MN are deactivated. This implies that when the MN decides to come back again to the GPRS network it will have to perform attach and authentication procedures as well as the activation of the needed PDP Contexts again.

Those procedures (attach, authentication and PDP Context activation) spend a lot of time and therefore the handover performance in the intersystem handover is really non-optimal when the target network is GPRS.

By using the method described in this invention, the MN will remain attached and will maintain the associated PDP Contexts when the MN moves from GPRS to any other access network. Thus, when the MN comes back to the GPRS network again, it will not have to spend time to perform attach or PDP Context procedures which reduces considerably the handover delay for the intersystem handovers to the GPRS network.

**4. How was the problem solved earlier?**

There is no previous solution for maintenance of PDP Context in GPRS.

**5. How does the invention improve earlier solutions? Advantages and disadvantages of the invention?**

Advantages:

- The PDP Contexts associated to the MN remain activated and the MN does not have to activate them when comes back to the GPRS network after the intersystem handover to any other network. This implies in a considerably reduction of the time spent in the intersystem handover.
- The MN remains attached to the GPRS network so the MN does not have to be re-attached during the intersystem handover when moves to the GPRS network again. This implies in a considerably reduction of the time spent in the intersystem handover.

As main drawback of maintaining the PDP Context activated during the intersystem handover it could be possible that the maintained PDP Context could be considered invalid. The reasons for that could be that the ongoing applications running on the MN are completely different than the ones which the PDP Context

*I have read and understood the invention described in this Invention Report*

3

Date:

Signature of Manager



was activated for, i.e. the MN has moved from GPRS to any other network and it has started to use other different applications with other requirements before coming back to the GPRS network. This could imply either in a modification of the QoS requirements for the maintained PDP Context or, more drastically, in the release of the maintained PDP Context and later activation of a new PDP Context. In both cases, the signalling generated is practically the same than the signalling generated in the case the maintenance of the PDP Context feature proposed by this invention is not utilized.

**6. Brief description of the drawings (Please enclose drawings and figures of the invention on a separate document)**

No enclosed figures.

[REDACTED]

**8. Explain, how the invention is/can be implemented.** [REDACTED]

It could be achieved by just modifying the value of a timer existing in the SGSN depending on the MN's multi-access capabilities.

This timer is the RAU timer (Routing Area Update) — T3312, specified by the standard 3GPP TS 24.008. The RAU timer is triggered when the MN goes to PMM-IDLE state from PMM-CONNECTED state (for Iu mode) or to STANDBY state from READY state (for Gb mode). Every time this timer expires the MN shall initiate the RAU procedure and the timer is reset. In case the MN does not initiate the RAU procedure (this will occur when the MN abandons the GPRS network because it has moved to any other access network, e.g. WLAN) the network automatically performs detach and consequent resource release (as PDP Context release) for that MN.

The value of the RAU timer is given to the MN by the network (SGSN) during the attach procedure (Attach Accept message) and it is assumed that the value of the timer is preconfigured in the GPRS network by the operator and that it is always the same for all the MNs being attached to the GPRS network.

What this invention proposes is to give different values for that timer depending on the multi-access capabilities supported by the terminal (the SGSN is aware of the MN's capabilities by the Attach Request message sent by the MN). In case the MN is multi-access capable, then the value for that timer should be longer than the value given to a MN which is not multi-access capable, this way the initiation of the RAU procedure (which the MN will not be able to perform whilst it is using the WLAN access network) will be delayed until the MN is supposed to be back in the GPRS network (and the MN can perform it). This way, the multi-access capable MNs are able to move to any other access technology and afterwards come back to the GPRS network, maintaining the attach and the PDP Context activated in the GPRS network.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

*I have read and understood the invention described in this Invention Report*

4

Date:  
Signature of Manager



**11. Abbreviations**

|      |                              |
|------|------------------------------|
| GPRS | General Packet Radio Service |
| MN   | Mobile Node                  |
| PDP  | Packet Data Protocol         |
| RAU  | Routing Area Update Timer    |
| SGSN | Serving GPRS Support Node    |
| WLAN | Wireless Local Area Network  |

**12. Any further comments**

*I have read and understood the invention described in this Invention Report*

5

Date:  
Signature of Manager



NET/IMN/STB/lps  
Erkki Yli-Juuti

02 June 2003

Dear Ms. Shackleton

NC39965 is merged with NC34945 on 2. June 2003.

Our ref. 39965

Infrastructures-Portfolio

**Inventors**

**Tel.**

**Fax**

Leopoldo Alarcon

Nationality: ES

Home address

Sandro Grech

Nationality: MT

Pedro Serna

Nationality: ES

Nokia Responsible

Tuula Rintamäki

**Basic Invention:**

This invention relates to IP session continuity across inter-access networks such as WLAN and GPRS. The problem is that when a mobile node (MN) moves from GPRS to any other access network, e.g. WLAN, the MN is detached and the PDP Contexts associated to that MN are deactivated. When the MN decides to come back again to the GPRS network it will have to perform attach and authentication procedures as well as the activation of the needed PDP Contexts again. The invention proposes a method by means of which the PDP Contexts can be maintained activated whilst the MN moves from GPRS to any other access network and after that decides to come back again to the GPRS network. This reduces the handover delay for the intersystem handovers to the GPRS network. The invention can be implemented by modifying the value of a timer RAU (Routing Area Update) existing in the SGSN depending on the MN's multi-access capabilities. The value of the RAU timer is given to the MN by the network (SGSN) during the attach procedure and it is assumed that the value of the timer is reconfigured in the GPRS network by the operator and that it is always the same for all the MNs being attached to the GPRS network. Invention proposes to give different values for timer depending on the multi-access capabilities supported by the terminal. In case the MN is multi-access capable the value for that timer should be longer than the value given to a MN which is not multi-access capable. This way the initiation of the RAU procedure will be delayed until the MN is supposed to be back in the GPRS network. The multi-access capable MNs are able to move to any other access technology and afterwards come back to the GPRS network, maintaining attach and the PDP Context activated in the GPRS network. Keyword: OWLAN, broadband convergence



NET/IMN/STB/lps  
Erkki Yli-Juuti

02 June 2003

Recommendation to PC:

Ad hoc decision MER was made by Juha Perttula and Tuula Rintamäki 2.6.2003.

According to Sundquist Jaakko the intended feature of being able to maintain the PDP context, while not actively using GPRS is a desired one. Suggested mechanism seems to help in maintaining the PDP context, while the terminal is using another network, and thus I feel that standardization is probably worthwhile. Some terminals may be able to use two radios at the same time and thus are able to maintain the PDP context, while using WLAN for example. I would rather explain that the invention is most suitable for terminals that are only capable of using one radio at a time.

Pekka Pollari commented that this invention presumes that the handover really happens and especially that the GPRS PDP context is closed and WLAN access is utilized instead. It is also possible, that the GPRS coverage is still there while entering in WLAN area, and even if the WLAN is utilized as a data bearer, the GPRS PDP context is not necessarily closed. It is possible to have both WLAN and GPRS PCMCIA card installed in the laptop and just use one of these, even if both have coverage. The frequency or usefulness of inter-system handovers might be quite low. This invention could be utilized in other scenarios as well, i.e. temporarily missing network coverage or cases where there is multiple GPRS networks and roaming is heavily utilized. The latter case is rather useful when traveling in a car and there are more than one operator providing coverage and the end-user is constantly switching between operators.

Naghian Siamak would propose to merge this invention with other two inventions (39886 and 34945) that cover the same area as they are very close to each other and this invention may not bring significant enhancement to the prior art.

Inventor Leopoldo agree that the invention is most suitable for terminals that are only capable of using one radio at a time. In the inventions 39886 and 34945 attach and the PDP contexts are not maintained in GPRS when the MN moves to WLAN (in case the MN is not able to use the both radios at a time).

These inventions solve (or reduce considerably) the problem performing the GPRS attach and PDP Context activation in advance to the movement from WLAN to GPRS. This invention 39965 solves the problem keeping the MN attached in GPRS and the PDP Context activated while the MN moves to WLAN. They are two very different alternatives to solve the problem.

My proposal is MER to 34945.

Merge info:

Ad hoc decision MER was made by Juha Perttula and Tuula Rintamäki 2.6.2003.

Please acknowledge receipt of this assignment by e-mail.

Yours sincerely

on behalf of  
Tuula Rintamäki

Minna Lehtisalo  
NET/IMN



# Exhibit V





NS





**Patent-Agency PWF (EXT-RES/London)**

From: Rintamaki Tuula (NET/Tampere)  
 To: Patent-Agency PWF (EXT-RES/London)  
 Cc: APP-NOTESNET\_Itchy@nokia.com  
 Subject: FW: NC39965 merged with NC34945

Sent: Tue 03/06/2003 07:28

Attachments:  PWF 2.6.2003.doc(77KB)  39965 Invrep.doc(119KB)

Hi Nicola,

We decided to merge invention NC 349965 with NC 34945   
 invention NC34945 and this new 39965   
 and NC 34945   


BR

Tuula

&gt; -----Original Message-----

&gt; From: Lehtisalo Minna (EXT-EilaKaisla/Tampere)

&gt; Sent: 02 June, 2003 12:40

&gt; To: Patent-Agency PWF (EXT-RES/London)

&gt; Cc: Rintamaki Tuula (NET/Tampere)

&gt; Subject: NC39965 merged with NC34945

&gt; Importance: High

&gt;

&gt;

&gt; Attn: Nicola Shackleton

&gt;

&gt;

&gt;

&gt; Dear Ms Shackleton,

&gt;

&gt; NC39965 is merged with NC34945 (you are drafting at the moment) today.

&gt; Please find attached Basic invention &amp; Recommendation to PC

&gt; and invention report of the NC39965.

&gt;

&gt;

&gt; Best Regards

&gt; Minna Lehtisalo

&gt;

&gt;

&gt; &lt;&lt;PWF 2.6.2003.doc&gt;&gt; &lt;&lt;39965 Invrep.doc&gt;&gt;

&gt;

&gt; Minna Lehtisalo

&gt; IPR Administrator


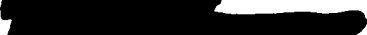
&gt; HVT 30 / B 450

&gt;

&gt; NOKIA

&gt; P.O.Box 785

&gt; 33101 Tampere

> Phone: > Fax: > e-mail: 

&gt;

&gt;

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&gt;



# Exhibit VI



**Patent-Agency PWF (EXT-RES/London)**

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

From: Patent-Agency PWF (EXT-RES/London)

Sent: Thu 05/06/2003 14:43



To: Rintamaki Tuula (NET/Tampere)

Cc: Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo (EXT-UMA/Malaga)

Subject: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft

Attachments:  303490-Draft-Spec.doc(62KB)  Neil\_0605142938\_001.pdf(19KB)

Hi Tuula,

Attached is the first draft for NC34945.   


Best regards.

Nicola



# Exhibit VII



25


**Patent-Agency PWF (EXT-RES/London)**

**From:** Rintamaki Tuula (NET/Tampere)  
**To:** Patent-Agency PWF (EXT-RES/London)

**Sent:** Tue 10/06/2003 11:53

**Cc:**

**Subject:** FW: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft, "No Record"

**Attachments:**  303490-Draft-Spec\_LAI.doc(151KB)

> -----Original Message-----

> From: Alarcon Leopoldo (EXT-UMA/Malaga)

> Sent: 10 June, 2003 13:50

> To: Rintamaki Tuula (NET/Tampere); Krishnamurthi Govind (NRC/Boston);

> Chaskar Hemant (NRC/Boston); Trossen Dirk (NRC/Boston); Grech Sandro

> (NET/Espoo); Serna Pedro (NET/Malaga)

> Subject: RE: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB),

> Application draft

>

>

> Hi all,

>

> please find attached my comments. 



> BR,

> -Leo

>

> -----Original Message-----

> From: Rintamaki Tuula (NET/Tampere)

> Sent: 09 June, 2003 13:02

> To: Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo

> (EXT-UMA/Malaga); Chaskar Hemant (NRC/Boston); Trossen Dirk

> (NRC/Boston); Grech Sandro (NET/Espoo); Serna Pedro (NET/Malaga)

> Subject: FW: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB),

> Application draft

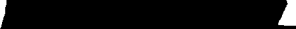
> Importance: High

>

>

> Hi,

>

> Patent attorney send the first draft. 



> Regards

>

> Tuula

>

> > -----Original Message-----

> > From:

> > Sent: 05 June, 2003 16:43

> > To: Rintamaki Tuula (NET/Tampere)

> > Cc: Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo

> > (EXT-UMA/Malaga)

> > Subject: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB),

> > Application draft

> >


> >



# Exhibit VIII



**Patent-Agency PWF (EXT-RES/London)**

**From:** Alarcon Leopoldo (EXT-UMA/Malaga) **Sent:** Tue 10/06/2003 11:53  
**To:** Patent-Agency PWF (EXT-RES/London)  
**Cc:** Rintamaki Tuula (NET/Tampere)  
**Subject:** FW: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft  
**Attachments:**  303490-Draft-Spec\_LAI.doc(151KB)

Hello Nicola, sorry for not including you in my email (see below).

BR,  
-Leo

-----Original Message-----

**From:** Alarcon Leopoldo (EXT-UMA/Malaga)  
**Sent:** 10 June, 2003 12:50  
**To:** Rintamaki Tuula (NET/Tampere); Krishnamurthi Govind (NRC/Boston); Chaskar Hemant (NRC/Boston); Trossen Dirk (NRC/Boston); Grech Sandro (NET/Espoo); Serna Pedro (NET/Malaga)  
**Subject:** RE: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft

Hi all,


please find attached my comments. 

BR,  
-Leo

-----Original Message-----

**From:** Rintamaki Tuula (NET/Tampere)  
**Sent:** 09 June, 2003 13:02  
**To:** Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo (EXT-UMA/Malaga); Chaskar Hemant (NRC/Boston); Trossen Dirk (NRC/Boston); Grech Sandro (NET/Espoo); Serna Pedro (NET/Malaga)  
**Subject:** FW: Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft  
**Importance:** High

Hi,

Patent attorney send the first draft. 

Regards

Tuula

> -----Original Message-----

> **From:** Patent-Agency PWF (EXT-RES/London)  
> **Sent:** 05 June, 2003 16:43  
> **To:** Rintamaki Tuula (NET/Tampere)  
> **Cc:** Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo (EXT-UMA/Malaga)  
> **Subject:** Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft  
>



# Exhibit IX



**Patent-Agency PWF (EXT-RES/London)**

**From:** Rintamaki Tuula (NET/Tampere)  
**To:** Patent-Agency PWF (EXT-RES/London)  
**Cc:** APP-NOTESNET\_Itchy@nokia.com  
**Subject:** FW: 303490GB

Sent: Fri 13/06/2003 06:29

**Attachments:**  303490-Draft-Spec\_LA1.doc (114KB)

Hi,

Here are more comments.

-Tuula

> -----Original Message-----

> From: Krishnamurthi Govind (NRC/Boston)

> Sent: 12 June, 2003 20:04

> To: Rintamaki Tuula (NET/Tampere); Krishnamurthi Govind

> (NRC/Boston); Chaskar Hemant (NRC/Boston); Trossen Dirk

> (NRC/Boston); Grech Sandro (NET/Espoo); Serna Pedro

> (NET/Malaga); Alarcon Leopoldo (EXT-UMA/Malaga)

> Subject: 303490GB

>

> <<303490-Draft-Spec\_LA1.doc>>

>

> Here are my comments. Please let me know if you have any questions.

>

> Regards,

> Govind.

---

<<303490-Draft-Spec\_LA1.doc>>



# Exhibit X




**Patent-Agency PWF (EXT-RES/London)**

**From:** Rintamaki Tuula (NET/Tampere)  
**To:** Patent-Agency PWF (EXT-RBS/London)

**Sent:** Wed 18/06/2003 12:11

**Cc:**

**Subject:** Tuula Rintamaki/Nicola Shackleton, NC34945 (303490GB), Application draft, "No Record"

**Attachments:**  303490-Draft-Spec\_LAI.doc(116KB)

Hi Nicola,

I hope you have already got comments from Govind and Leopoldo.

BR

Tuula

> -----Original Message-----

> **From:** Krishnamurthi Govind (NRC/Boston)

> **Sent:** 12 June, 2003 20:04

> **To:** Rintamaki Tuula (NET/Tampere); Krishnamurthi Govind

> (NRC/Boston); Chaskar Hernant (NRC/Boston); Trossen Dirk

> (NRC/Boston); Grech Sandro (NET/Espoo); Serna Pedro

> (NET/Malaga); Alarcon Leopoldo (EXT-UMA/Malaga)

> **Subject:** 303490GB

>

> <<303490-Draft-Spec\_LAI.doc>>

>

> Here are my comments. Please let me know if you have any questions.

>

> Regards,

> Govind.

---

<<303490-Draft-Spec\_LAI.doc>>





# Exhibit XI



Copy

**Patent-Agency PWF (EXT-RES/London)**

**From:** Patent-Agency PWF (EXT-RES/London) **Sent:** Tue 24/06/2003 10:35  
**To:** Rintamaki Tuula (NET/Tampere)  
**Cc:** Krishnamurthi Govind (NRC/Boston); Alarcon Leopoldo (EXT-UMA/Malaga)  
**Subject:** Rintamaki Tuula/Nicola Shackleton, NC34945 (303490GB), Application draft  
**Attachments:**  Drawings NC34945 (303590GB).pdf(41KB)  303490-Draft-Spec.doc(85KB)

Hi Tuula,

Attached is a revised draft for the proposed UK patent application.

[REDACTED]

[REDACTED]

[REDACTED]

Best regards.

Nicola.